陕西师范大学 SHAANXI NORMAL UNIVERSITY

化学化工学院 School of Chemistry & Chemical Engineering

新概念传感器与分子材料研究院 INSTITUTE OF NEW CONCEPT SENSORS AND MOLECULAR MATERIALS

新概念传感器与分子材料研究院 简报 04 2024

Institute of New Concept Sensors and Molecular Materials Newsletter

目 录 Contents

研究院召开项目讨论及论证会

INCSMM project discussion and demonstration meeting held

2024 年 4 月 12 日，新概念传感器与分子材料研究院召开了 2024 年春季学期项目讨论及论证会。

会上，刘凯强教授做了超级粘合剂应用研发项目论证报告。刘凯强从粘合剂分类，市场现有产品性能以及聚氨酯粘合剂的研究进展进行了详细汇报，对下一步将要开展的对接产业界需求做了初步的规划。

张荷兰老师介绍了马兰戈尼效应和奥斯特瓦尔德熟化对凝胶乳液稳定性的影响，以及以凝胶乳液为软模板制备高分子泡沫材料的一系列突出的优点。

房喻院士进行了总结，希望与会老师瞄准产业界需求，表示研究院将对孵化的具有良好产业化前景的项目给予一定经费支持。

On April 12, 2024, the Institute of New Concept Sensors and Molecular Materials held a project discussion and demonstration meeting for the spring semester of 2024.

In the meeting, Prof. Liu Kaiqiang made a demonstration report on the super adhesive application project. Liu reported from the classification of adhesives, the performance of products available in the market and the research progress of polyurethane adhesives, and made a preliminary plan for the next step to be carried out to meet the needs of the industry.

Dr. Zhang Helan introduced the effects of Marangoni effect and Ostwald Ripening on the stability of gel emulsion, as well as some outstanding advantages of using gel emulsion as soft template for the preparation of polymer foam.

Prof. Fang Yu concluded the meeting, as he hoped that the participating teachers would aim at the demands of the industry, promising that the institute would give certain financial support to the incubated projects with good industrialization prospects.

房喻院士出席第七届新型功能材料研讨会

Fang Yu attends 7th Symposium on New Functional Materials

2024 年 4 月 13 日，房喻院士应邀赴宝鸡出席了由宝鸡文理学院化学化工学院主办的第七届新型功能材料研讨会。

来自国内外一流高校的 15 名国家杰青、21 名国家“四青”人才等 180 余名化学、材料领域顶级专家参会，开展了 6 个特邀报告和 53 个邀请报告，涵盖光电、生物、产业化等多个领域，围绕近年来新型功能材料领域的前沿科学问题进行了深入研讨。香港中文大学（深圳）唐本忠院士和房喻院士分别对会议报告进行了点评。

On April 13, 2024, Prof. Fang Yu attended the 7th Symposium on New Functional Materials hosted by the College of Chemistry and Chemical Engineering of Baoji University of Arts and Sciences.

More than 180 top experts in the field of chemistry and materials, including 15 recipients of National Science Fund for Distinguished Young Scholars, 21 recipients of other national youth talents programs from first-class universities at home and abroad, attended the conference, and presented six specially-invited reports and 53 invited reports, covering the fields such as optoelectronics, biology, and industrialization, discussing advanced scientific problems in the field of new functional materials in recent years. Prof. Benzhong Tang of the Chinese University of Hong Kong (Shenzhen) and Prof. Fang Yu commented on the reports.

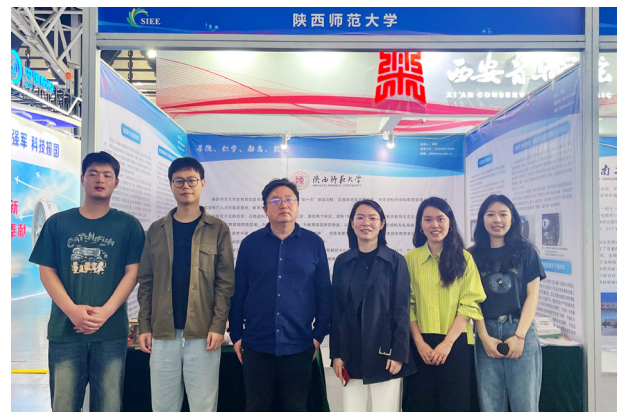
研究院成果亮相系列科创展会

INCSMM projects showcased in science and innovation expos

2024 年 4 月 15 日至 17 日，新概念传感器与分子材料研究工程技术人员王佩参加了由中国高等教育学会主办，厦门大学等单位承办的第 61 届中国高等教育博览会，展示介绍了研究院开发的二氧化氯气体缓释产品与防水透气膜材料。

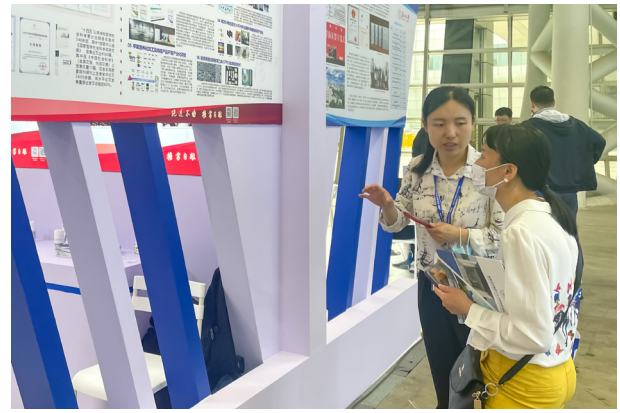
4 月 18 日，研究院工程技术人员罗艳彦参加了由中国国际科学技术合作协会主办，陕西省科学技术厅等单位承办的第八届陕西国际科技创新创业博览会暨秦创原创新发展国际论坛，展示推广了透气不透水内相结构可调高强度高分子膜材料、便携式 BTEX 检测仪、低损耗介电梯度材料等三项研究院创新科研项目。

此外，研究院的三个代表项目还在陕西师范大学科学技术处组织下于 4 月 12 日参加了由香港特别行政区香港贸易发展局主办的香港国际创科展。



From April 15 to 17, 2024, Wang Pei, an engineering and technical staff member of the Institute of New Concept Sensors and Molecular Materials Research, participated in the 61st China Higher Education Expo, which was sponsored by China Society of Higher Education and organized by Xiamen University, etc., and demonstrated and showcased the chlorine dioxide gas slow-release products and waterproof breathable membrane materials developed by the institute.

On April 18, Luo Yanyan, engineering and technical staff member of the institute, participated in the 8th Shaanxi International Science and Technology Innovation and



Entrepreneurship Expo and Qinchuangyuan International Forum on Innovation and Development hosted by China Association for International Science and Technology Cooperation and organized by Shaanxi Science and Technology Department, etc., and demonstrated and showcased three INCSMM innovative research projects, such as breathable and impermeable inner-phase structurally adjustable high-strength high polymer membrane materials, portable BTEX detector, and low-loss dielectric gradient materials.

In addition, the three representative INCSMM projects were also showcased in the Hong Kong International Innovation and Technology Fair organized by the Hong Kong Trade Development Council of the Hong Kong Special Administrative Region on April 12 under the organization of the Science and Technology Department of Shaanxi Normal University.

研究院师生参与项目获“挑战杯”全国大学生竞赛二等奖

INCSMM participated-project wins second prize of Challenge Cup National College Student Competition

近期，新概念传感器与分子材料研究院师生参与的作品《鲜为“胺”知——中国首创高灵敏肉品新鲜度荧光检测设备》在第十八届“挑战杯”全国大学生课外学术科技作品竞赛中获得二等奖。

本次大赛由共青团中央、中国科协、教育部、中国社会科学院、全国学联主办，贵州大学承办，参赛作品由研究院与陕西师范大学食品工程与营养科学学院师生联合完成，参赛指导老师为房喻院士和彭军霞教授及食品学院的刘永峰教授，参赛学生为研究院的刘倩倩、梁晶晶、苟欣瑜，及食品学院的张朵朵、马浩睿、张诗泉、肖宇、肖颖。


获奖证书

陕西师范大学

张朵朵、刘倩倩、马浩睿、梁晶晶、张诗泉、苟欣瑜、肖宇、肖颖 同学：

你（们）的作品《鲜为“胺”知——中国首创高灵敏肉品新鲜度荧光检测设备》在第十八届“挑战杯”全国大学生课外学术科技作品竞赛中荣获

二等奖

指导教师：刘永峰、彭军霞、房喻　　编号：2023-TZB18-MA20532H-B6AD27

特颁此证，以兹鼓励

二〇二三年十二月

Recently, the project “ ‘Amine’ Knows It Fresh - The first high sensitivity meat freshness fluorescence detection device in China” participated by teachers and students of the Institute of New Concept Sensors and Molecular Materials won the second prize in the 18th Challenge Cup National Extracurricular Scholarly and Technological Works Competition for College Students.

The competition was sponsored by the Central Committee of the Communist Youth League, China Association for Science and Technology, Ministry of Education, Chinese Academy of Social Sciences, All-China Federation of Students, and hosted by Guizhou University. The project was jointly completed by teachers and students from the Institute and the School of Food Engineering and Nutritional Sciences of Shaanxi Normal University, and the instructors are Prof. Fang Yu and Prof. Peng Junxia and SFENS Prof. Liu Yongfeng, and the participating students are Liu Qianqian, Liang Jingjing and Gou Xinyu from the Institute and Zhang Duoduo, Ma Haorui, Zhang Shiquan, Xiao Yu and Xiao Ying from the School of Life Sciences.

房喻院士出席第一届前沿交叉科学论坛并作大会报告

Fang Yu presents at first Frontier and Interdisciplinary Science Forum

2024 年 4 月 28 日，房喻院士应邀出席在西安交大创新港举行的第一届前沿交叉科学论坛并作题为《敏感材料创新与 CBRN 传感器——以薄膜荧光传感器为例》的大会报告。

房喻院士从基础科学的价值入手，结合世界发达国家对基础研究领域的重视程度及自己多年的科研经历，强调了基础研究的重要性。聚焦传感器研发过程，详细介绍薄膜荧光传感器研究的核心关键技术—敏感材料和自主知识产权配套硬件，并从传感器敏感材料、薄膜材料界面工程以及薄膜传感器基底衬底优化三方面探讨了敏感材料的研究进展，为与会青年厘清科研思路，规范科研流程，将基础研究做实做细提供参考范例。

本次论坛由西安交通大学前沿科学技术研究院主办，汇聚国内外顶尖专家学者，共话科技创新与新质生产力发展的前沿问题，以期为推动科学进步和社会发展贡献力量。

江桂斌院士、杨秀荣院士、管晓宏院士、樊春海院士、徐政和院士，及来自全国各地 33 所高校、科研院所的专家学者及企业负责人参加此次论坛。

On April 28, 2024, Prof. Fang Yu attended the first Frontier and Interdisciplinary Science Forum held in the Western China Science And Technology Innovation Harbour of Xi'an Jiaotong University in Xi'an, and presented a report titled "Sensitive Material Innovation and CBRN Sensors - Taking Film-based Fluorescence Sensors as an Example".

Starting from the value of basic science in combination with the importance attached by developed countries in the field of basic research and his own years of research experience, Fang Yu emphasized the importance of basic research. Focusing on the research and development process of sensors, he introduced the core and key technologies of film-based fluorescence sensors - sensitive materials and supporting hardware with independent intellectual property rights, and discussed the research progress of sensitive materials from three aspects of sensor sensitive materials, film material interface engineering and film sensor substrate optimization, so as to clarify the research ideas and standardize the research process for the young attendees, providing a reference example for carrying solid basic research.

Sponsored by XJTU's Frontier Institute of Science and Technology, this forum brings together top experts and scholars at home and abroad to discuss cutting-edge issues of technological innovation and new quality productivity development, with a view to contributing to the promotion of scientific progress and social development.

CAS Academicians Jiang Guibin, Yang Xiurong, Guan Xiaohong, Fan Chunhai, Xu Zhenghe, as well as experts, scholars from 33 universities and research institutes and heads of enterprises attended the forum.

Angewandte International Edition Chemie
GDCh A Journal of the German Chemical Society

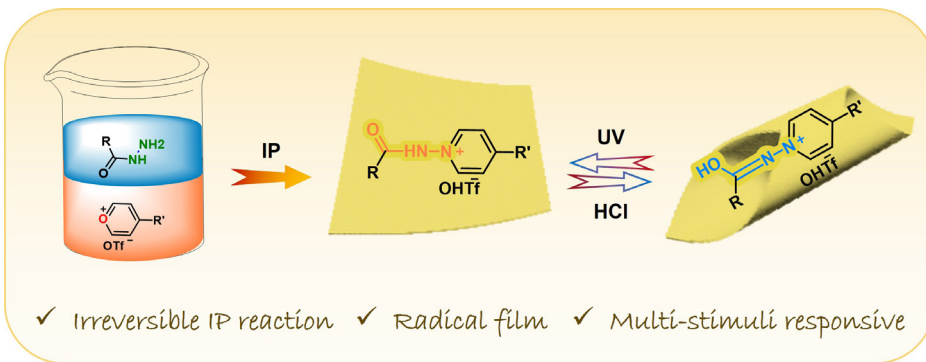
Research Article | Full Access

Fabrication of Large-area Multi-stimulus Responsive Thin Films via Interfacially Confined Irreversible Katritzky Reaction

Yuanhong Shu, Yan Luo, Hexi Wei, Lingya Peng, Jingjing Liang, Binbin zhai, Liping Ding, Yu Fang

First published: 15 April 2024 | https://doi.org/10.1002/anie.202402453

经由不可逆 Katritzky 反应的大面积多重刺激响应性薄膜的界面限域制备



共价有机骨架（COF）薄膜及其类似的无定形聚合物薄膜，凭借其可调的结构、丰富的物理和化学特性以及潜在的孔隙率，为智能材料的发展提供了新的机遇。当前，通过气－液、液－液、气－固、液－固界面进行原位聚合来制备这类薄膜已经相对成熟，且被广泛采用。然而，目前能够利用的反应类型相对较少，严重限制了薄膜结构和功能上的多样性。

在本工作中，我们发展了一种新的温和界面聚合策略，利用不可逆的 Katritzky 反应，在 CH_2Cl_2–H_2O 界面上，无需催化剂，且在室温条件下，即可制备出大面积、自支撑且具有多刺激响应性质的薄膜。这一创新性的界面制备方法无疑为薄膜材料的制备和应用开创了新的可能性。

得到的薄膜的厚度可灵活调整，其面积可延展至 50 cm^2。尤为引人注目的是，它在紫外光的刺激下能够迅速发生卷曲或弯曲运动，其响应时间可短至 0.1 秒以内，其响应速度超过了一众晶态材料。而一旦置于盐酸蒸气环境中，它又能迅速恢复原有的形状。此外，该薄膜还能对特定有机蒸气作出响应，发生卷曲运动，而当转移至空气中时，又能迅速回复至平直状态。这一系列出色的光 / 气体致动性能使得该薄膜在人造肌肉、软体机器人、微流控系统等多个领域展现出无比巨大的应用潜力。

另一方面，这类薄膜担载有阳离子，使其具备捕获阴离子自由基的能力。在紫外光照射下，阴离子自由基能被有效清除。因此，该薄膜可应用于捕获和清除环境中的活性氧，为环境保护和生物医疗领域提供了有力的支持。

第一作者：舒远红博士，陕西师范大学
通讯作者：房喻院士、丁立平教授，陕西师范大学
全文链接：https://onlinelibrary.wiley.com/doi/10.1002/anie.202402453

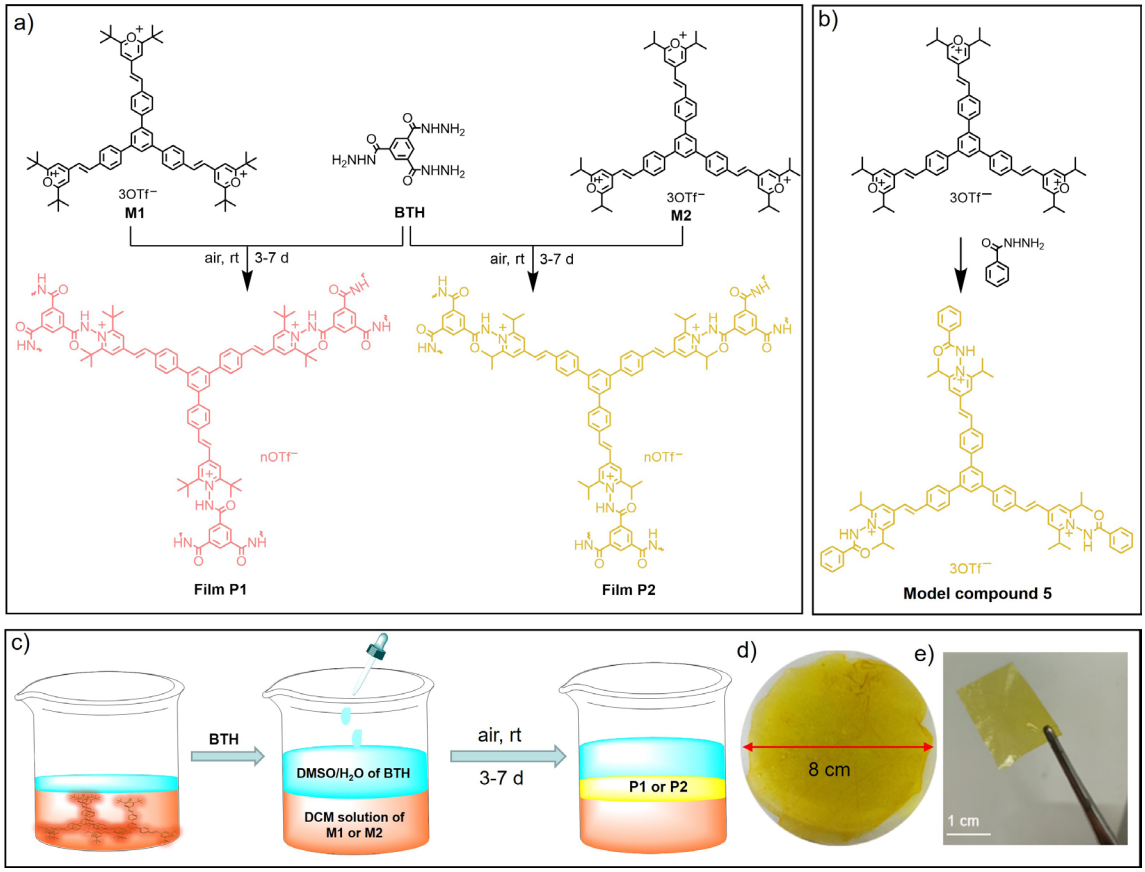


图 1. 制备薄膜的分子砌块的结构式以及薄膜制备过程示意图

Figure 1. Molecular structure of building block for thin film preparation and schematic diagram of the thin film preparation process

Covalent organic framework (COF) films and similar amorphous polymer films offer new opportunities for the development of smart materials due to their tunable structures, rich physical and chemical properties, and potential porosity. Currently, the preparation of such films through in situ polymerization at gas-liquid, liquid-liquid, gas-solid, and liquid-solid interfaces has become relatively mature and widely adopted. However, the limited availability of reaction types severely restricts the structural and functional diversity of the films.

In this work, we developed a novel and mild interface polymerization strategy using the irreversible Katritzky reaction at the interface of CH_2Cl_2 and H_2O. This method allows for the preparation of large-area, self-standing films with multiple stimuli-responsive properties without the need for a catalyst and under ambient conditions. This innovative interface preparation method undoubtedly opens up new possibilities for the fabrication and application of film materials.

The obtained films have adjustable thickness and can be extended up to an area of 50 cm^2. Particularly notable is their rapid curling or bending motion under ultraviolet (UV) light stimulation, with response times as short as 0.1 s, surpassing many crystalline materials in terms of response speed. Once exposed to HCl vapor, the film quickly recovers its original shape. Furthermore, the film responds to specific organic vapors by undergoing curling motion, which can rapidly return to a flat state when transferred to air. These remarkable photo and gas-responsive properties make this film highly promising for applications in artificial muscles, soft robots, microfluidic systems, and other fields.

On the other hand, these films carry cations, endowing them with the ability to capture anionic free radicals. Under UV light irradiation, the anionic free radicals can be effectively eliminated. Therefore, these films can be applied to capture and remove reactive oxygen species in the environment, providing strong support for environmental protection and biomedical applications.

First Author: Dr. Shu Yuanhong, Shaanxi Normal University

Correspondence Authors: Prof. Fang Yu and Prof. Ding Liping, Shaanxi Normal University

Full Text Link: https://onlinelibrary.wiley.com/doi/10.1002/anie.202402453

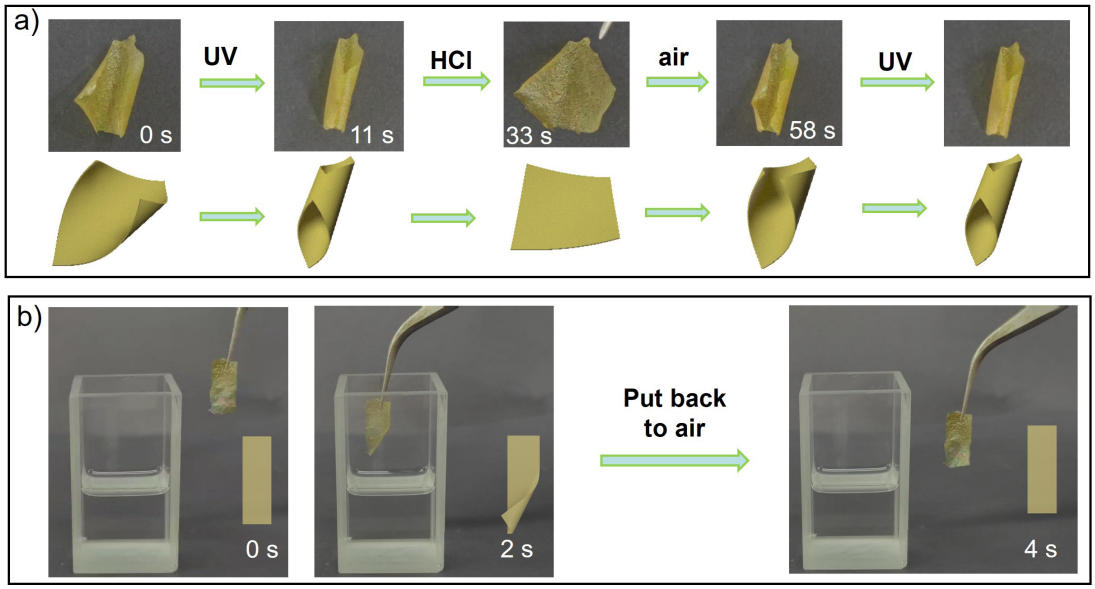


图 2. 薄膜在紫外光、盐酸气体和有机蒸气的刺激下的机械运动

Figure 2. Mechanical motions of the thin film under the stimulation of UV, HCl gas, and organic vapor

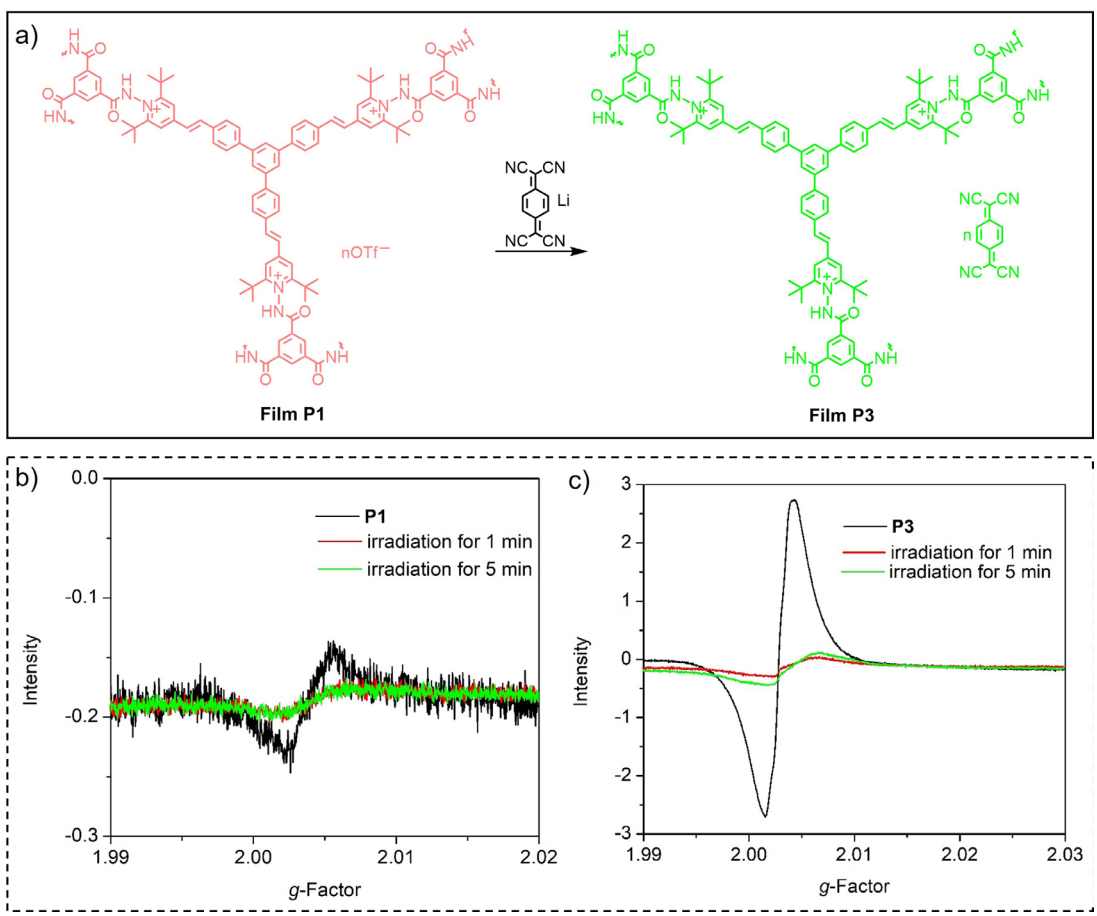


图 3. 薄膜捕获自由基的机制以及光照前后的电子顺磁共振 (EPR) 谱图

Figure 3. Mechanism of thin film capturing free radicals and EPR spectra before and after UV irradiation

ADVANCED FUNCTIONAL MATERIALS

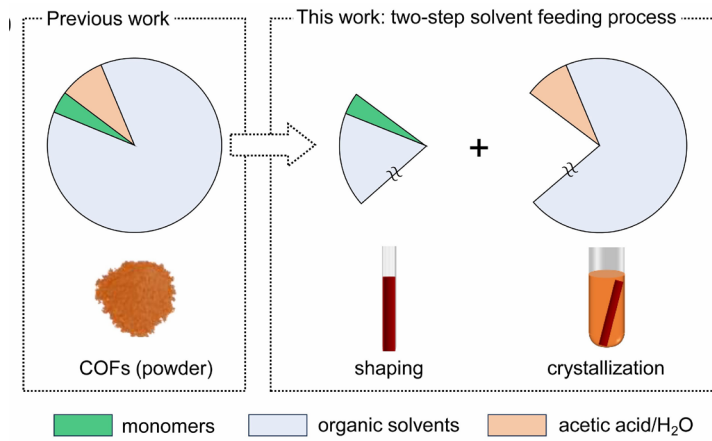
Research Article | Full Access

Solvothermal Shaping of Imine-Linked Covalent Organic Frameworks by a Two-Step Solvent Feeding Process

Yajiao Su, Molin Qin, Jinglin Kong, Quanguo Zhai, Daqiang Yuan, Zhongshan Liu, Yu Fang

First published: 01 April 2024 | https://doi.org/10.1002/adfm.202400433

溶剂热法成型制备 COFs 的普适性策略



共价有机框架（COFs）材料的比表面积大、孔道高度有序，是理想的气体吸附分离材料。然而，大多数 COFs 主要是采用溶剂热方法合成的粉晶。COFs 粉末的不溶性和可加工性差导致其不易成型，限制了其实际应用。根据实验现象和前期研究基础，我们将溶剂热法难以成型制备 COFs 材料这个问题归因于单体的快速聚合和相分离。

基于以上认识，我们提出了一种两步溶剂进料策略，以控制单体发生聚合反应而诱导的相分离过程，结合溶剂热法实现了 COFs 的成型制备。我们采用少量 1,4– 二氧六环和水先将醛 / 胺单体溶解（单体质量占比为 20%），在无催化条件下原位聚合获得无定形整体材料；然后补充有机溶剂和乙酸溶液，在高温下晶化得到 COFs 整体材料。由此可以看出，两步溶剂进料策略没有改变溶剂热法中的制备条件。为展示该策略的普适性，我们合成了其他三种 COFs 整体材料。

鉴于 COFs 整体材料的多级孔结构、较高的比表面积和丰富的共轭体系，我们将其用于苯蒸气的吸附。静态吸附实验表明 ETTA–TPA COFs 整体材料对苯蒸气的吸附量较高，为 16.8 mmol g^{-1}，尤其在 1 kPa 的低压条件下的吸附量达到了 7.6 mmol g^{-1}，其吸附性能优于大部分多孔材料。

我们的研究证实了两步溶剂进料策略可以有效地与传统的溶剂热法相结合，提高 COFs 的溶液加工性。这种改进的溶剂热方法可以很容易地成型制备 COFs 以满足实际应用要求，这对于探索 COFs 的性质、优化其应用性能以及实现其工业化生产具有重要意义。

第一作者：陕西师范大学硕士研究生苏雅娇
通讯作者：陕西师范大学刘忠山副研究员、中国科学院福建物质结构研究所袁大强研究员

全文链接：https://onlinelibrary.wiley.com/doi/10.1002/adfm.202400433

Covalent organic frameworks (COFs), which are ordered porous channels and high surface areas, are ideal gas adsorption and separation materials. Solvothermal synthesis is the predominant method for creating new structured COFs, yet it grapples with challenges in controlling shape and morphology. This issue is attributed to the unregulated solvent-feeding process, which results in rapid polymerization and uncontrolled phase separation.

To overcome the abovementioned limitations, we propose a two-step solvent-feeding process to facilitate a solvothermal approach for the synthesis of COF monoliths. we use a small amount of solvent (e.g., 1,4-dioxane) to dissolve monomers (20 wt.%). The polymerization reaction of aldehydes with amines results in amorphous monoliths. The rest of the organic solvents, acetic acid, and water are added for crystallization. By combining this two-step solvent feeding process with the conventional solvothermal method, preparation conditions (e.g., solvent composition, reaction temperature and time) do not need to be re-optimized and four COF monoliths with hierarchical porosity are achieved.

Leveraging the hierarchical porosities and conjugated frameworks, we have demonstrated the application of COF monoliths in the adsorption and removal of benzene. The ETTA-TPA COFs monolithic material had a high adsorption capacity of 16.8 mmol g^{-1} for benzene, and especially the adsorption capacity reached 7.6 mmol g^{-1} under the low-pressure condition of 1 kPa, which was superior to most of the porous materials in terms of adsorption performance.

In summary, we have successfully demonstrated a two-step solvent-feeding process that enables the solvothermal method for shaping COFs. Our research provides a promising tool for producing COFs with modulated shapes, which is crucial for advancing their practical applications.

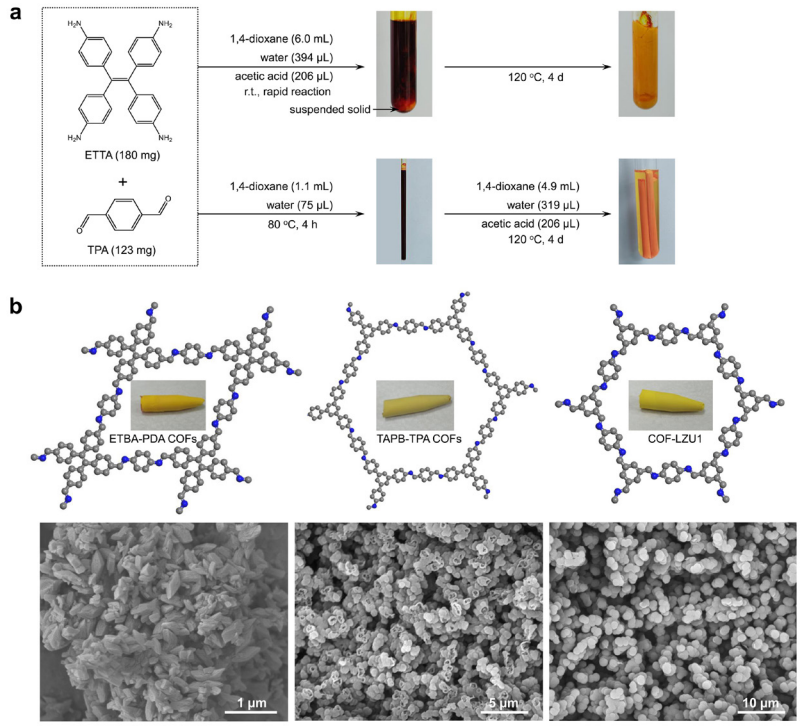


图 1.（a）传统溶剂热法与两步溶剂进料策略的对比；（b）方法普适性验证

Figure 1.(a) One-step (top) and two-step (bottom) solvent feeding processes for solvothermal synthesis of ETTA-TPA COFs; b) The generality of the two-step method

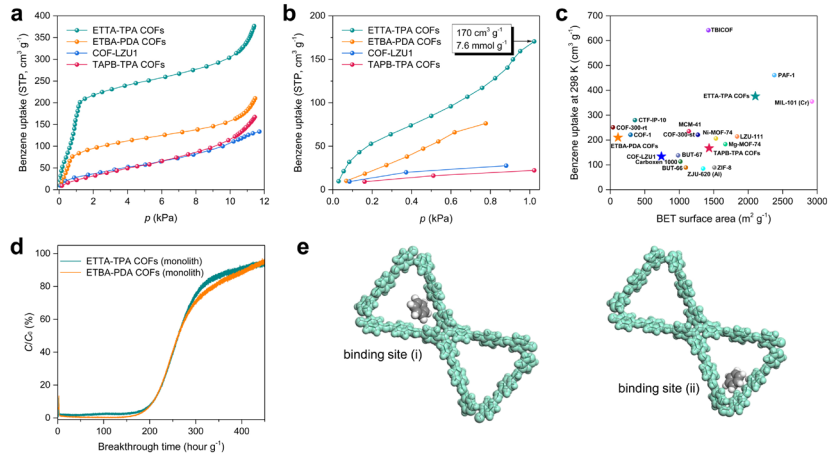


图 2.COFs 整体材料对苯蒸气的吸附性能

Figure 2. The application of COF monoliths in the adsorption and removal of benzene

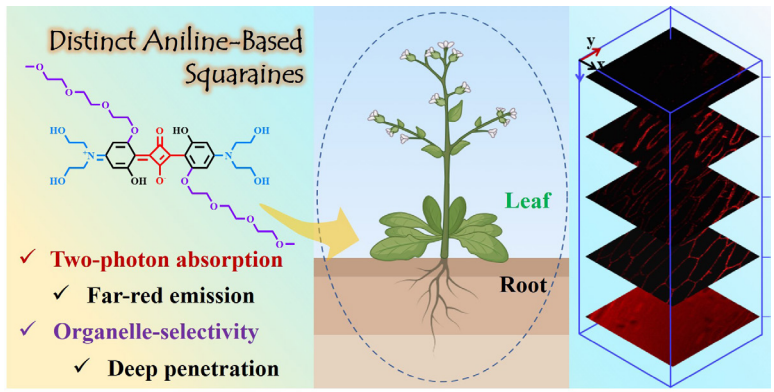
First Author: Su Yajiao, master's candidate, Shaanxi Normal University
Correspondence Authors: Dr. Liu Zhongshan, Shaanxi Normal University, Dr. Yuan Daqiang, Fujian Institute of Research on the Structure, Chinese Academy of Sciences
Full Text Link: https://onlinelibrary.wiley.com/doi/10.1002/adfm.202400433

From the journal:
Journal of Materials Chemistry B

Structure-activity relationships of aniline-based squaraines for distinguishable staining and bright two-photon fluorescence bioimaging in plant cells

Nan Zhang, Haixia Chang, Rong Miao, Taihong Liu, Liping Ding and Yu Fang

方酸菁衍生物的亲疏水性及双光子荧光植株活体生物成像应用



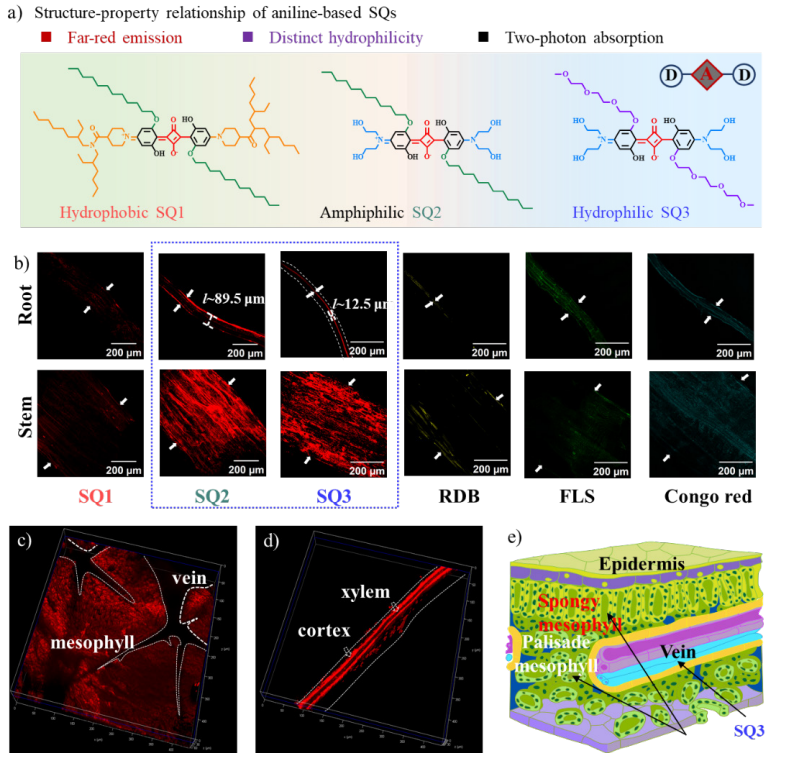
当今时代，以数字化、智能化为特征的新一轮工业革命蓬勃兴起，物联网、大数据、人工智能等新一代信息技术与农业农村加速渗透融合，推动我国农业迈向智慧农业时代。提高农业信息化水平，准确获取植物对温度、墒情、养料、农药的需求量以及对植物病害的早期监测和预防具有重要意义。双光子荧光成像技术利用荧光物质的生物环境敏感性，高效反馈活体植物的细胞活动、光合作用和基因行为等。位于生物光谱窗口（650 nm ~ 1450 nm）范围内的近红外发射荧光物质因生物组织穿透力强、光散射少以及成像信噪比高等优点而受到持续关注。同时，由于光散射少和植物组织的自发荧光可以忽略的优点，双光子吸收和双光子激发荧光技术在高分辨率生物成像和光动力学治疗方面取得了重大进展。

本文设计合成了三种具有不同亲疏水特性的对称型四偶极方酸菁衍生物，分别为疏水型 SQ1、双亲型 SQ2 和亲水型 SQ3（图 1a）。首先利用 UV–vis、荧光光谱技术系统表征了三种化合物的本征光物理性质。研究表明，不同亲疏水特性的方酸菁衍生物在水中表现出较大的光谱差异，反映了该类化合物在水中不同的聚集行为；同时也表明方酸菁的近核修饰策略可以有效抑制 D–A–D 型方酸菁衍生物的自聚集现象。随后基于实验室研究基础，利用飞秒开孔 Z– 扫描技术考察了三种化合物的双光子吸收特性，获得了宽波幅范围的双光子吸收和较大的近红外双光子吸收截面。双亲性 SQ2 和亲水型 SQ3 的最大双光子吸收截面值在 800 nm 处分别约为 1060 GM 和 1220 GM，同时二者具有较好的荧光量子产率和综合发光特性。进一步基于激光共聚焦显微镜考察了植物细胞的模拟生物成像效果，三种方酸菁衍生物在细胞实验中表现明显差异；疏水型 SQ1 快速吸收和均匀分布在洋葱表皮细胞壁中；双亲性 SQ2 对液泡和细胞核有特殊的亲和力，而亲水性 SQ3 特殊标记细胞液泡。最后，基于双光子荧光探针成像技术，选用拟南芥幼苗为研究对象，对三种方酸菁衍生物在其根部和叶片中染色情况进行对比（图 1b），并进一步在植物组织

中展示了深层组织穿透和高分辨率三维重构（图 1c–e），高效用于生物成像分辨应用。总结而言，该工作系统揭示了方酸菁衍生物细微结构差异，导致了不同可视化生物成像效果，并建立了新型近红外双光子荧光化合物在植株活体成像中的应用范式。

该论文被选为 Journal of Materials Chemistry B 热点论文。

第一作者：陕西师范大学硕士研究生张楠
通讯作者：陕西师范大学房喻教授、刘太宏副教授
全文链接：https://doi.org/10.1039/D4TB00400K



图（a）三种不同亲疏水结构的方酸菁衍生物分子结构；（b）三种方酸菁衍生物对拟南芥幼苗根和茎成像效果与商业荧光分子的效果对比；（c，d）拟南芥幼苗叶片和根部双光子荧光 3D 成像效果图；（e）拟南芥幼苗叶片构造和亚细胞示意图

Figure (a) Molecular structures of the three aniline-based squaraines; (b) Temporal monitoring of squaraines and commercial fluorophores in the roots and stems; (c, d) 3D two-photon fluorescence microscopy images of the Arabidopsis leaf incubated with SQ2; (e) Diagram of the Arabidopsis leaf architecture and cell landscape.

Organelle-selective vision provides insights into the physiological response of plants and crops to environmental stresses in sustainable agriculture ecosystems. NIR-emitting fluorophores within the notably biological spectral window (650~1450 nm) are of ongoing interest due to the merits of deep tissue penetration, reduced light scattering, and high imaging signal-to-noise ratio. Novel small-molecule organic fluorophores for specific staining and fixing delimit the cellular contour, thus enabling a clear distinction between extracellular and intracellular components. Therefore, photochemically stable and selective NIR-emitting fluorophores with enhanced brightness are highly desirable. In the past few years, two-photon absorption and two-photon excited fluorescence techniques have advanced significantly in high-resolution bioimaging and photodynamic therapy due to the remarkable advantages of reduced scattering and ignorable auto-fluorescence of normal tissue. Regarding efficient two-photon excited fluorophores, their characteristics of high two-photon absorption cross sections and rational incubation play important roles in practical applications, e.g., bioimaging.

In this contribution, three aniline-based suqaraines (hydrophobic SQ1, amphiphilic SQ2, and hydrophilic SQ3) tuned from hydrophobic to hydrophilic characteristics were obtained, and their steady-state optical properties were first studied. Modifications of increased steric hindrance close to the squaraine core aided in reducing their self-aggregation. Broadband two-photon absorption and excellent two-photon absorption cross section values were acquired based on the open-aperture Z-scan method. The maxima two-photon absorption cross section values of amphiphilic SQ2 and hydrophilic SQ3 were found to be ~1060 GM and ~1220 GM at 800 nm, respectively. Mimicked biological applications in the plant cells were further conducted by the confocal laser scanning microscope. Interestingly, though similar absorbance spectra of the squaraines in neat solvents, corresponding apparent differences were observed in the cellular trials. Rapid uptake and uniform distribution of hydrophobic SQ1 in the onion epidermal cell wall were investigated. Amphiphilic SQ2 had special affinities to the vacuole and nucleus, unlike the hydrophilic SQ3 differently attached to the former. Based on the two-photon fluorescence microscopy, comparative staining profiles in the roots and leaves of the Arabidopsis seedlings were accomplished. Deep tissue penetration and high-resolution three-dimensional reconstruction in the plants were further demonstrated toward bioimaging applications.

This paper is selected in the themed collection: Journal of Materials Chemistry B HOT Papers.

First Author: Zhang Nan, master's candidate, Shaanxi Normal University
Correspondence Authors: Prof. Fang Yu, and A/Prof. Liu Taihong, Shaanxi Normal University
Full Text Link: https://doi.org/10.1039/D4TB00400K

中国航天科技六院李光熙总指挥一行来访

Visitors from China Aerospace S&T Corporation Sixth Research Institute received

2024 年 4 月 11 日，中国航天推进技术研究院（中国航天科技集团公司第六研究院）李光熙总指挥一行到访新概念传感器与分子材料研究院，参观了综合展厅，并与房喻院士进行了座谈交流。

陪同来访的有航天六院十一所室主任黄鋆，室副主任李斌潮，副主任设计师朱向东和豆飞龙。研究院刘凯强教授、办公室主任杨小刚和张荷兰老师参加了座谈交流。

On April 11, 2024, chief director Li Guangxi of China Academy of Space Propulsion Technology (the Sixth Research Institute of China Aerospace Science and Technology Corporation) and his delegation visited the Institute of New Concept Sensors and Molecular Materials, and had a talk with Prof. Fang Yu after visiting the the comprehensive exhibition room.

Accompanying Li Guangxi were Sixth Research Institute's Section 11 director Huang Yun, section deputy director Li Binchao, deputy chief designer Zhu Xiangdong and Dou Feilong. INCSMM Prof. Liu Kaiqiang, Administrative Office director Yang Xiaogang and Ms Zhang Helan participated in the talks and exchanges.

西安光机所付玉喜研究员一行来访

XIOPM's Fu Yuxi received

2024 年 4 月 19 日，中国科学院西安光学精密机械研究所光子科学与技术部副部长、阿秒科学与技术中心常务副主任付玉喜研究员付玉喜研究员一行四人到访新概念传感器与分子材料研究院，与房喻院士、丁立平教授、刘太宏副教授、部分工程技术人员和研究生就超快光谱表征和数据分析研究进行了讨论交流，双方同意今后将继续加强科研合作。

On April 19, 2024, a group of four researchers from the Xi'an Institute of Optics and Precision Mechanics, Chinese Academy of Sciences, led by Fu Yuxi, deputy head of Photonics Science and Technology and executive deputy director of Attosecond Science and Technology Center, visited the Institute of New Concept Sensors and Molecular Materials, discussed with Prof. Fang Yu, Prof. Ding Liping, Assoc. Prof. Liu Taihong, research assistants and some graduate students on ultrafast spectral characterization and data analysis, and two sides agreed to continue to strengthen research cooperation in the future.

北京大学盖锋教授应邀作报告

Prof. Gai Feng of Peking University invited to give a report

2024 年 4 月 22 日上午，北京大学讲席教授盖锋老师应邀访问新概念传感器与分子材料研究院，并作了题为“蛋白质动力学位点特异性的研究”的学术报告。

盖锋教授介绍了他在美国宾夕法尼亚大学以及北京大学开展的三个方面工作，详细讲解了蛋白质构象折叠动力学，流感病毒质子通道迁移以及蛋白质特异性位点氢键超快动力学。盖锋教授指出，结合超快振动光谱以及特异性振动探针可以揭示发生在生物化学以及生物物理中的不同时间尺度的重要动力学过程。

本次报告会由边红涛教授主持，研究院和化学化工学院部分教师及研究生，北京师范大学物理系张文凯教授参加了此次报告会，并与盖锋教授进行了学术交流。会后，房喻院士向盖锋教授介绍了研究院产学研方面的相关情况。

On April 22, 2024, Gai Feng, Chair Professor of Peking University, was invited to visit the Institute of New Concept Sensors and Molecular Materials, and gave a report titled “Study of Site Specificity of Protein Dynamics”.

Prof. Gai introduced three aspects of his work at the University of Pennsylvania and Peking University, explaining in detail the dynamics of protein conformational folding, the migration of the influenza virus proton channel, and the ultrafast dynamics of hydrogen bonding at protein-specific sites. Prof. Gai pointed out that the combination of ultrafast vibrational spectroscopy and specific vibrational probes can reveal important kinetic processes occurring on different time scales in biochemistry and biophysics.

The presentation was hosted by Prof. Bian Hongtao, and teachers and graduate students from the Institute and the School of Chemistry and Chemical Engineering, and Prof. Zhang Wenkai from the Department of Physics of Beijing Normal University attended the report and had academic exchanges with Prof. Gai. After the meeting, Prof. Fang Yu briefed Prof. Gai about the research, teaching and industrial transformation of the Institute.

边境国门学校“红烛苗圃”青少年交流成长营来院参观

Border Gateway School “Red Candle Nursery Garden” Youth Camp visitors received

2024 年 4 月 22 日，陕西师范大学边境国门学校“红烛苗圃”各族青少年交流成长营的 100 名各族青少年在带队老师和大学生志愿者的带领下来到新概念传感器与分子材料研究院参观。

副院长丁立平教授向同学们介绍了研究院的宗旨理念、首席专家、科研团队等情况，带领同学们参观了科研成果展厅，讲解了研究院发展历程、承担的项目、获得的奖项，以及成果转化的探测器系列产品等，并鼓励同学们好好学习，将来上大学、做科研，报效祖国。

On April 22, 2024, 100 primary school students of multiple ethnic groups from the Shaanxi Normal University's Border and Gateway School “Red Candle Nursery Garden” Youth Exchange and Growth Camp visited the Institute of New Concept Sensors and Molecular Materials, accompanied by their teachers and SNNU student volunteers.

INCSMM vice dean Prof. Ding Liping introduced the mission and vision of the institute, the lead scientist, the research team, and showed the students the exhibition room of research achievements, explaining the development history of the institute, the projects undertaken, the awards won, and the commercialization of the detector series products, etc., and encouraged the students to study hard, go to university and do scientific research to serve the motherland.

总策划：房喻教授
Producer & Editor-in-Chief: Prof. Fang Yu
责任编辑：边红涛 冯伟
Executive Editors: Bian Hongtao, Feng Wei
翻译：冯伟
Translator: Feng Wei
校对：团队全体老师
Proofreading: Fang Group teachers

地址：陕西省西安市长安区西长安街 620 号陕西师范大学长安校区
Chang’an Campus, Shaanxi Normal University, 620 West Chang’an Avenue, Chang’an District, Xi’an, Shaanxi, P. R. China
联系电话 (Tel)：86-29-81530726
电子邮箱 (Email)：incsmm@snnu.edu.cn

装帧设计：泛象艺术空间
Designed by FanForm Art Space